

THE U.S. ACADEMY OF SCIENCE

SESSION AT WASHINGTON

THE U.S. National Academy of Science held its meetings this year at the Smithsonian Institution, the venerable Prof. Henry, secretary of the Institution, presiding over the deliberations of the Academy. The session commenced on April 21 and lasted four days. By favour of the scientific editor of the *New York Tribune* we have obtained advanced reports. Our space permits us to give only the titles of the more important papers; but as Dr. Brown-Séquard's paper on the functions of the brain is of very great interest in reference to recent researches on the subject, we shall give a longish abstract of it.

Among the papers of importance were the following:—Dr. J. L. Le Conte read a paper On a classification of the *Rhynchophorous coleoptera*. Prof. Fairman Rogers described an automaton to play tit-tat-too, which he had constructed.

Prof. A. M. Mayer read three papers, one entitled "Suggestions as to the functions of the spiral scalæ of the Cochlea, leading to an hypothesis of the mechanism of audition." The second paper was headed "Abstract of a research in the determination of the law connecting the pitch of a sound with the duration of its residual sensation, and on the determination of the number of beats—throughout the range of musical sounds—which produce the most dissonant sensations; with applications of these laws to the fundamental facts of musical harmony, and to various phenomena in the physiology of audition." Prof. Mayer gave the particulars of a series of experiments by which it was ascertained what must be the frequency of successive sounds to have them blend indistinguishably together. The third described a series of experiments on the reflection of sound from flames and heated gases.

Prof. Simon Newcomb, the astronomer in charge of the Washington Observatory, gave a description of the preparations in America for the observation of the coming transit of Venus. These are most thorough and complete.

Prof. Wolcott Gibbs, of Harvard University, read a paper On metamerism in organic chemistry. Prof. Gibbs has discovered six metameric bodies, a seventh having been discovered by Prof. Erdmann.

Comparative velocity of light in air and in vacuo, by Prof. Stephen Alexander of Princeton College. This brief paper merely contained a few interesting suggestions on a small correction of the velocity of light as deduced from experiment.

In accordance with the undulatory theory the velocity of light must be less in atmospheric air than in vacuo, in the inverse ratio of the index of refraction of atmospheric air to 1; that is, as 1 to 1.000294. The velocity then as ascertained by experiment under the air should be increased by just about 0.000294 of itself to be equal to that in vacuo; i.e. to the extent, almost exactly, of 55 miles per second; a very small quantity indeed in comparison with the whole velocity of 185,000 miles per second; and yet, small as it is—and so small as to be below the limits of error of the experiments in question—it is yet very closely equal to three times the velocity of the earth in its orbit.

It is an outstanding excess, and no more, with which we often have to do, as, for example, in the measurement of temperature; but the scale on which those differences sometimes present themselves makes them, small as they may be in their original comparison, grand in comparison with ordinary standards. Prof. Alexander was not aware that anything has yet been put forward elsewhere on this subject.

Prof. Hayden gave a general account of the scientific explorations and survey in the West in which he has been

engaged. With the results of these our readers are already pretty familiar.

In a paper On the laws of cyclones, by Prof. William Ferrel of the Coast Survey, the author gave a *résumé* of our knowledge on the subject and of some of the theories which have been advanced.

Dr. E. Bessels read a paper entitled "The History of Smith's Sound from a Geographical and Geological Point of View, and some other General Results of the *Polaris* Expedition." Dr. Bessels thinks that Smith's Sound must be regarded as the best of the three gateways to the pole. The land found between 81° and 82° seems to Dr. Bessels to be of great importance in demonstrating that Greenland has been separated from the continent in a south-north direction. Dr. Bessels stated several important facts bearing on the rising and sinking of the land on the Greenland coast.

Prof. Simon Newcomb gave a description of the great telescope at Washington; and a paper by Prof. S. Alexander of Princeton, N.J., On three of Jupiter's satellites, was read.

Prof. J. S. Newberry of Columbia College, New York, read a paper On Lower Silurian fossils. This was a memoir on the so-called land plants of the Lower Silurian in Ohio. Taking all the characters of these interesting fossils into consideration, Prof. Newberry is disposed to regard them as casts of the stems of fucoids.

The following papers were read by title only:—A memoir on the zodiacal light, by Prof. S. Alexander; On some points in Mallet's theory of vulcanicity, by Prof. E. W. Hilgard; The polarisation of the zodiacal light, by Prof. A. W. Wright. An exceedingly interesting and valuable paper on the mode of formation of the earth, its condition as to interior fluidity, and the probable limits within which it was reduced from a fluid state to its present condition, under the title of "A Criticism on the Contractual Hypothesis of the Earth's Surface Changes," was read by Capt. Clarence Dutton of the Ordnance Corps, U.S.A.

Dr. Brown-Séquard began his paper On the pretended localisation of the mental and the sensorial functions of the brain, by saying that the subject has been rendered more difficult by assumptions of physiologists upon insufficient data. Among the views which have been recently brought forward upon the localisation of nervous power in certain parts of the brain, there are two of importance: one relates to the seat of power actuating muscles, and the other is as to the seat of sensation for different nerves. In the latter particular, after noticing several exploded theories, some still pertinaciously adhered to by physicians, Dr. Brown-Séquard reviewed especially the assumption in respect to the seat of power for speech:—

"Let us consider the question of the locality of the intelligence of the brain. Most physiologists are agreed that this is the grey matter of the upper parts of the brain. But the method of communication is still open to research." (Here the lecturer went to the blackboard and drew a figure somewhat like a sheaf of wheat without a band around it; the stalks representing the nerves, the heads of wheat representing the cells.) "Now you may subtract from this, by disease or otherwise, say the upper third, and still you have the nerves and the nerve cells, and the processes can be carried on; but in the progress of such destruction downward there would eventually be reached a point where the functions of the brain could no longer exist. This view would explain the facts as we find them. But there is no case on record where the grey matter on both sides of the brain has been destroyed without the loss of intelligence, and we must regard the grey matter as the seat of the intelligence. But vast portions may be removed before the loss of intelligence becomes apparent. This I have myself tested and proved by vivisection of the lower animals."

"Now, in respect to the locality of the power of speech. It has been said that the loss of brain power to express ideas in speech was located in a certain part of the brain. This affection is called aphonia or aphasia. There are three modes of expressing ideas—by speech, by gesture, and by writing. It is with the first only that we are concerned. Some very bold theorists have tried to locate all these powers in a particular part of the brain. Let us confine ourselves to facts. Dr. Broca of Paris has advanced the view that a certain small portion of some of the convolutions of the brain holds the power of speech. I admit that facts seemed to favour this view. But we find that there is no relation between the degree of aphasia and the extent of the disease of that part, and there are cases where the destruction of those convolutions is very great, and the injury to speech very little. Secondly, we find that disease may have overtaken the anterior, the posterior, and the middle lobes of the brain, the particular convolution supposed to involve speech not being affected, and yet there is marked aphasia. Now, is some one of these lobes the locality of the power of speech? Such would be the reasoning of my opponents. We should be obliged to concede that in some persons the faculty of speech existed in one part of the brain, in some in another, in others another, and so on *ad infinitum*. This is a *reductio ad absurdum*.

"There is the case of the paralysis of the insane, where the grey matter may be diseased on both sides of the brain. In these cases the power of speech does not seem to be involved. There are cases of aphasia where the diseased person has had the power of speech restored during delirium. The speech is coherent though the sense may not be. It is evident, then, that the faculty of speech is not actually lost in such cases; and yet we find that the third frontal convolution is actually diseased in those aphasiacs who talk in their delirium. But the most decisive argument is found in the cases that I have seen, where the third frontal convolution, the alleged organ of speech, has been destroyed, and yet the patients have not lost the power of speech. Therefore the theory is itself destroyed. There are fifty cases on record to show that the question of right-handedness or left-handedness does not apply in the considerations." The lecturer here cited cases of Jacmet of Montpellier and Mr. Prescott-Hewitt of London. In the latter case the patient had suffered a destruction of that part of the brain for twenty years, and yet for twenty years had spoken.

"We shall now take up the question of the localisation of motion in certain parts of the brain. I am surprised at the avidity with which a certain series of facts has been accepted as proof of this theory in England. A very eminent man, of whom I should not like to say anything severe, my friend Prof. Carpenter, has accepted those views. I may say that all England has accepted them. Prof. Huxley, indeed, has written me, that he only accepted this view in part, but I cannot see how he can accept a part without accepting the whole, where even the part is incorrect. The famous experiments of Dr. Ferrier, of Guy's Hospital, must here be considered. As you will see, they are not, however, conclusive. By the application of galvanism to certain parts of the brain of animals, he produced certain movements. When we do not stop to think, this would seem to prove that there are in the brain certain centres of movement governing certain parts. But it is only a semblance. A part of the facts are taken for the whole. We should know all the series before we adopt the conclusions. Let us examine the other facts.

"It is perfectly well known that the cutting away of a large portion of the brain does not produce the least alteration of voluntary movement any where. Suppose that part of the brain, say the anterior lobe, being excited by galvanism, produces a movement in the anterior limb; now suppose that part of the brain is cut away, then the

anterior limb should be paralysed, for its voluntary movement is gone. Admitting that the other half of the brain should supply the place of the missing part, let us take that away also; then certainly there should be a paralysis of the anterior limbs. But there is not. This should be sufficient to invalidate the conclusions of Dr. Ferrier. But there are abundant pathological facts of this nature proving the fact beyond question. And then there are the cases of recovery from paralysis. There is no such localisation of power as Dr. Ferrier has assumed. If galvanism be applied to the severed leg of the frog the leg will jump although there is no brain power in the question.

"What should have been done was to have cut the connection of parts, so that a general effect should not have been propagated throughout the brain by the application of galvanism to a part. This would be the *experimentum crucis*. My friend Dr. Dupré of Paris has made this experiment. I made it also, before he did, but he published his before mine. But there are many other facts almost equally impressive in their character which may be cited. We find many cases where the lesion of part of the brain produces paralysis on the same side of the body, and not on the opposite side, as in the majority of cases is the rule. There is a case recorded where a ball passed directly through the brain, and it produced paralysis on the right side, instead of the corresponding side." Here Dr. Brown-Séquard objected to having a certain class of brain affections named after him, stating that diseases should be named from their distinctive features, and not after physicians.

Dr. Brown-Séquard then applied a similar course of reasoning to the localisation of sensation in specific parts of the brain, concluding by stating that it is evident we cannot locate the centres of either sensation or motion in specific parts of the nervous system.

THE LONG PERUVIAN SKULL

I WISH to place before comparative anatomists and anthropologists a question which has been encumbered by some misleading inaccuracies, in a recent communication by Dr. J. Barnard Davis to the Anthropological Institute, ("On Ancient Peruvian Skulls" Journ. Anthropol. Inst., vol. iii., p. 94). So early as 1857, in communications to the British Association, and to the American Association for the Advancement of Science, I showed, in opposition to the views of Dr. Morton, and of all American ethnologists up to that date, that a dolichocephalic type of head is characteristic of certain widely diffused American races. At a later date I set forth, in "Prehistoric Man," my reasons for believing that this, which is now universally acknowledged as true in general, may be specifically asserted of the ancient Peruvians. This latter proposition Dr. Davis undertakes to refute; it is not a mere matter of personal controversy, but a question of some ethnical significance. As a Canadian, I lie outside of the charmed circles of home science and criticism, and only receive tardy news even of such communications as this, in which I have a personal interest.

Dr. Davis has not himself had an opportunity of examining the evidence on which my opinion was formed; and, in the communication above referred to, shows that he fails to appreciate its nature or true bearing. He says, Dr. Wilson's view, "which is that the dolichocephalic Peruvian skulls are of natural form, was combated in the 'Thesaurus Craniorum.' Since that book was printed, I have received ample and satisfactory evidence as to the truth of the proposition that the long skulls owe their quality to artificial means. By the politeness of Dr. J. Aitken Meigs, of Philadelphia, I have obtained two Peruvian skulls which at one period belonged to Dr. Morton's collection, as a specimen of each kind. One of